NASA General Aviation Research

National General Aviation Roadmap

Small Aircraft Transportation System

Is SATS a Disruptive Innovation?

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Outline

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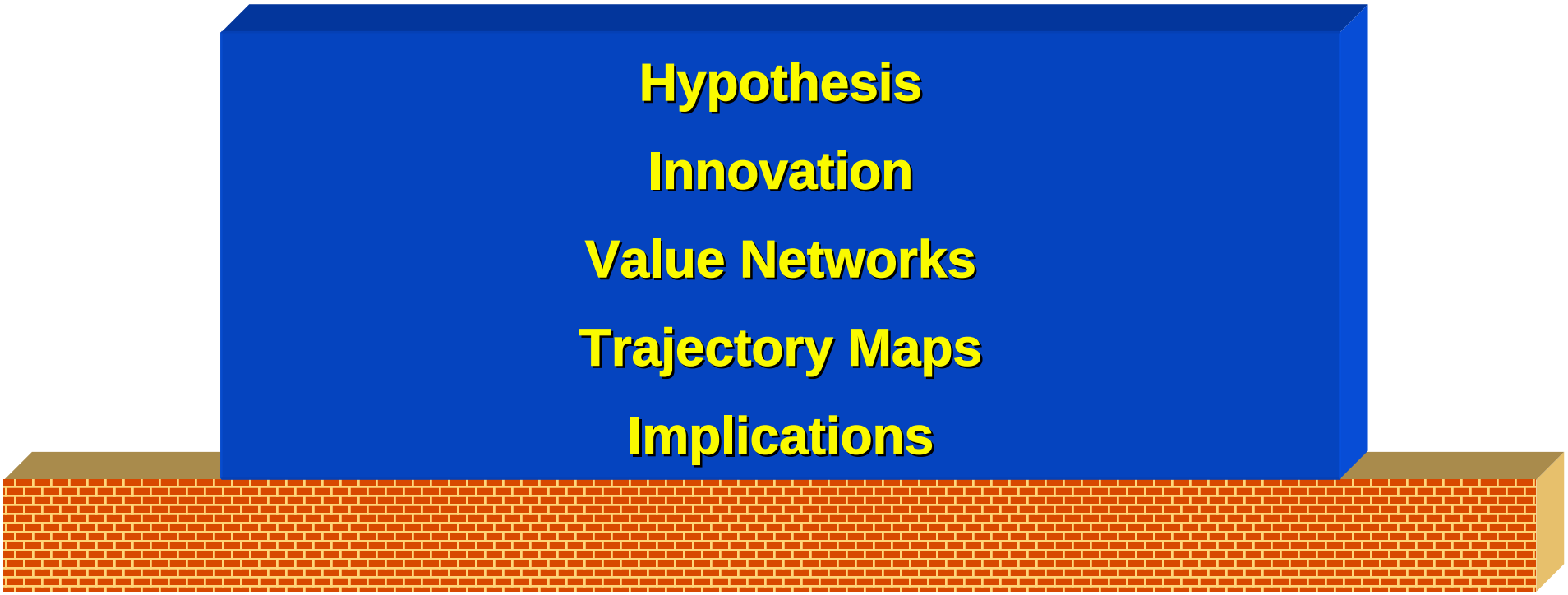

Hypothesis

SATS is a "Disruptive Innovation"

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SATS is a disruptive innovation comprised of a cluster of technologies targeted toward stimulation of latent markets for transportation of people, goods, and services.

Some SATS technologies will be of interest to current markets.

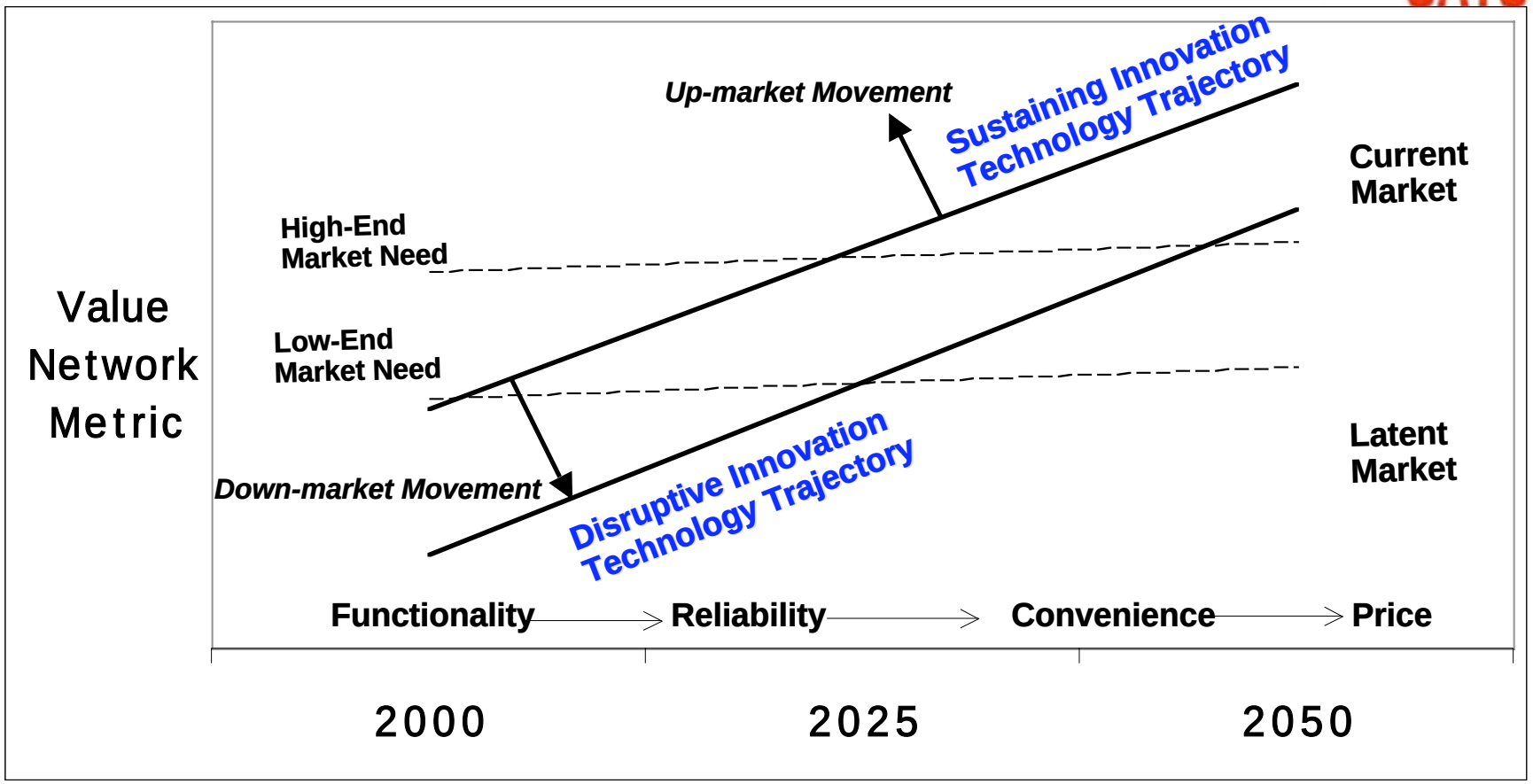
<u>However</u>, NASA is investing in SATS to stimulate the creation of the latent markets, NOT to satisfy current markets.

Latent SATS markets are defined as:

- **Trips not taken (due to time, cost, inaccessibility, or inconvenience)**
- **Trips not imagined (by current consumers for transportation of goods, services, or people)**
- **Trips not possible in current infrastructure (of vehicles, airports, and airspace)**

Innovation Categories

Clayton Christensen: The Innovators Dilemma, Harvard Business School Press, 1997

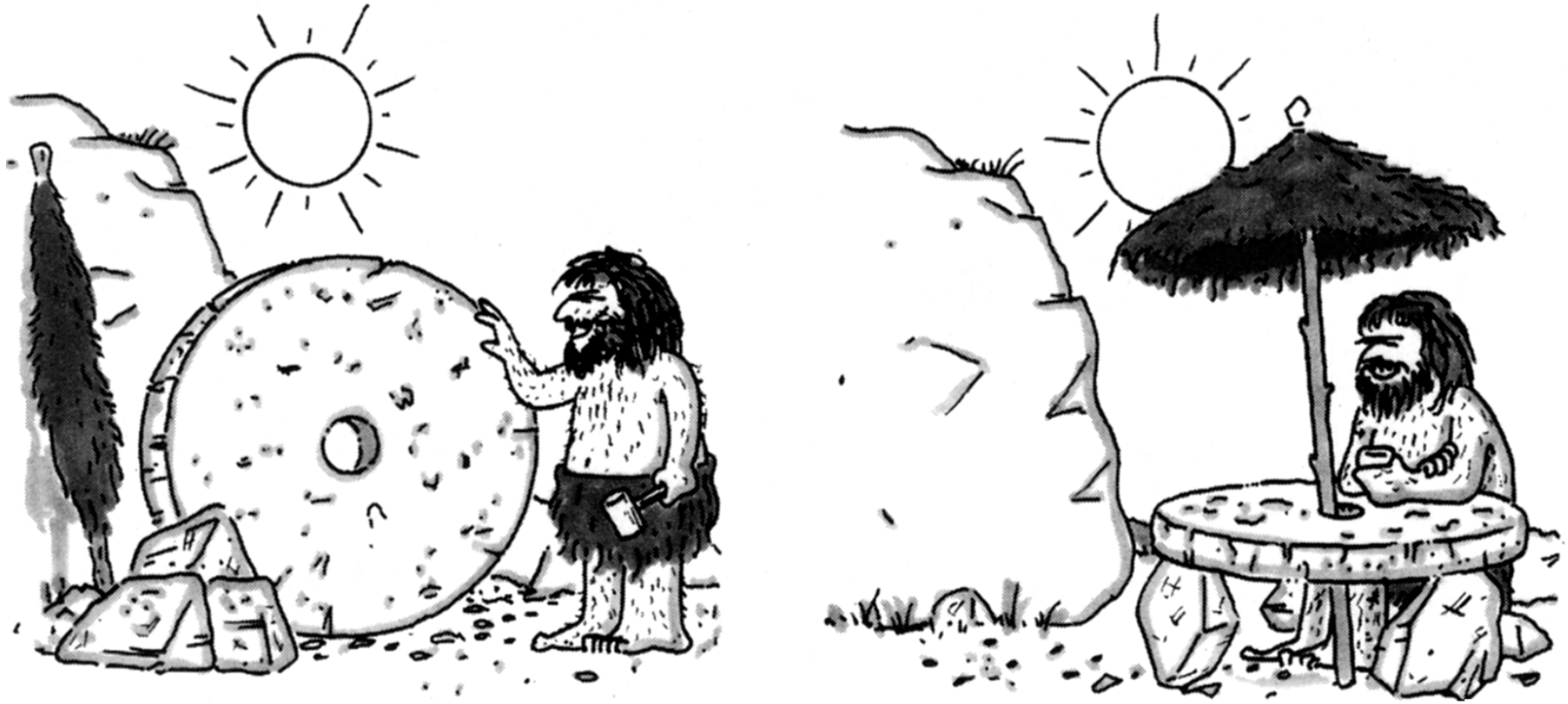


The innovators dilemma is that excellent management in established organizations drives resource allocations away from latent market enabling, paradigm-shifting innovations toward continued satisfaction of current market consumer and investor expectations.

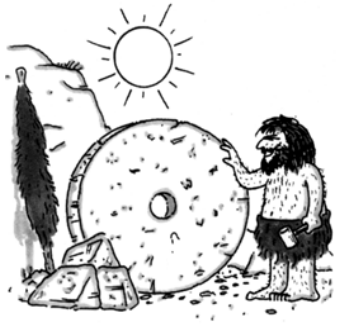
Disruptive Questions

1. What are the SATS value network metrics and technology trajectories?
2. What are the latent markets for SATS as a disruptive innovation?
3. How can consumer response to SATS be measured?
4. Who are likely first entrants into SATS products and services?
5. Is there a first mover's advantage in the SATS market?
6. Where are likely sites for SATS landing facilities first entrants?
7. How should government position SATS research to ensure success?
8. How should the industry position SATS research to ensure success?
9. How should the States position SATS research to ensure success?
10. Can SATS be successful if it is treated as a sustaining innovation?

What Is a Disruptive Innovation?



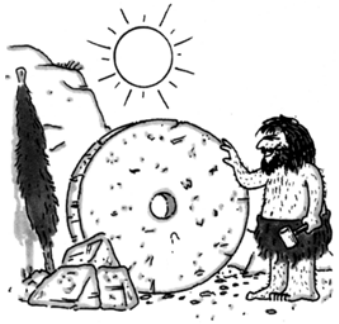
Definitions:
Sustaining Innovations



Sustaining Innovations:

- **Sustain historical rates of performance improvement...**
- **expected by existing consumers...**
- **supporting current investors' expectations for ROI...**
- **by an entrenched industry...**
- **competing on price.**

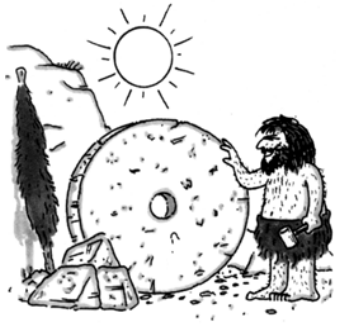
Definitions:
Sustaining Innovations



Research & Technology Development Implications

- **Sustaining innovations can range from incremental to radical**
- **R&T resource allocations are driven by consumers' & investors' expected rewards**
- **Customers are the most important source for sustaining innovations**
- **Up-market forces are natural outcomes of growth requirements**
- **Low-end (down-market) user requirements are left in a vacuum**
- **Down-market vision by an entrenched firm is nil**
- **Leadership in sustaining innovations is not essential for established firms**
- **Entrant firms do poorly at sustaining innovation competition**

Definitions:
Sustaining Innovators



Sustaining Innovators:

- **NASA: "Corporate Pork" programs**
- **FAA: NAS modernization of Air Traffic Services for Airlines in Hub-and-Spoke facilities and Flight Levels**
- **Industry: Sell airplanes to known consumers**
- **States: Use AIP funds for maintenance of current infrastructure**
- **Universities: Research & rewards serving current markets**

Definitions : Disruptive Innovations

Disruptive Innovations

- **Have strengths based on new value networks & consumer value criteria...**
- **do not meet the needs of existing customers...**
- **cannot satisfy the growth requirements of large established firms…**
- **cannot easily attract investors...**
- **offer a new functionality value only to fringe and emerging markets...**
- **have strengths that would be weaknesses in established markets.**

Definitions : Disruptive Innovations

Research & Technology Development Implications

- **Create new markets that do not yet exist and cannot be analyzed in traditional ways**
- **Expected rewards from latent consumers drive resource allocations toward paradigm shifting innovations**
- **Current customers cannot help define the market**
- **Down-market vision is essential and easier in entrant firms**
- **Leadership in innovations is essential for “first mover” advantage**
- **Entrant firms do well at disruptive innovation**
- **Established firms do poorly at disruptive innovation**

Definitions : Disruptive Innovators

Disruptive Innovators

- **NASA: Apollo, AGATE, SATS**
- **FAA: Free Flight**
- **Industry: Those who insulate R&D investments from current market drivers**
- **States: Those who insulate R&D investments from political drivers**
- **Universities: Those who practice academic freedom**

Innovation and Cost Life Cycles

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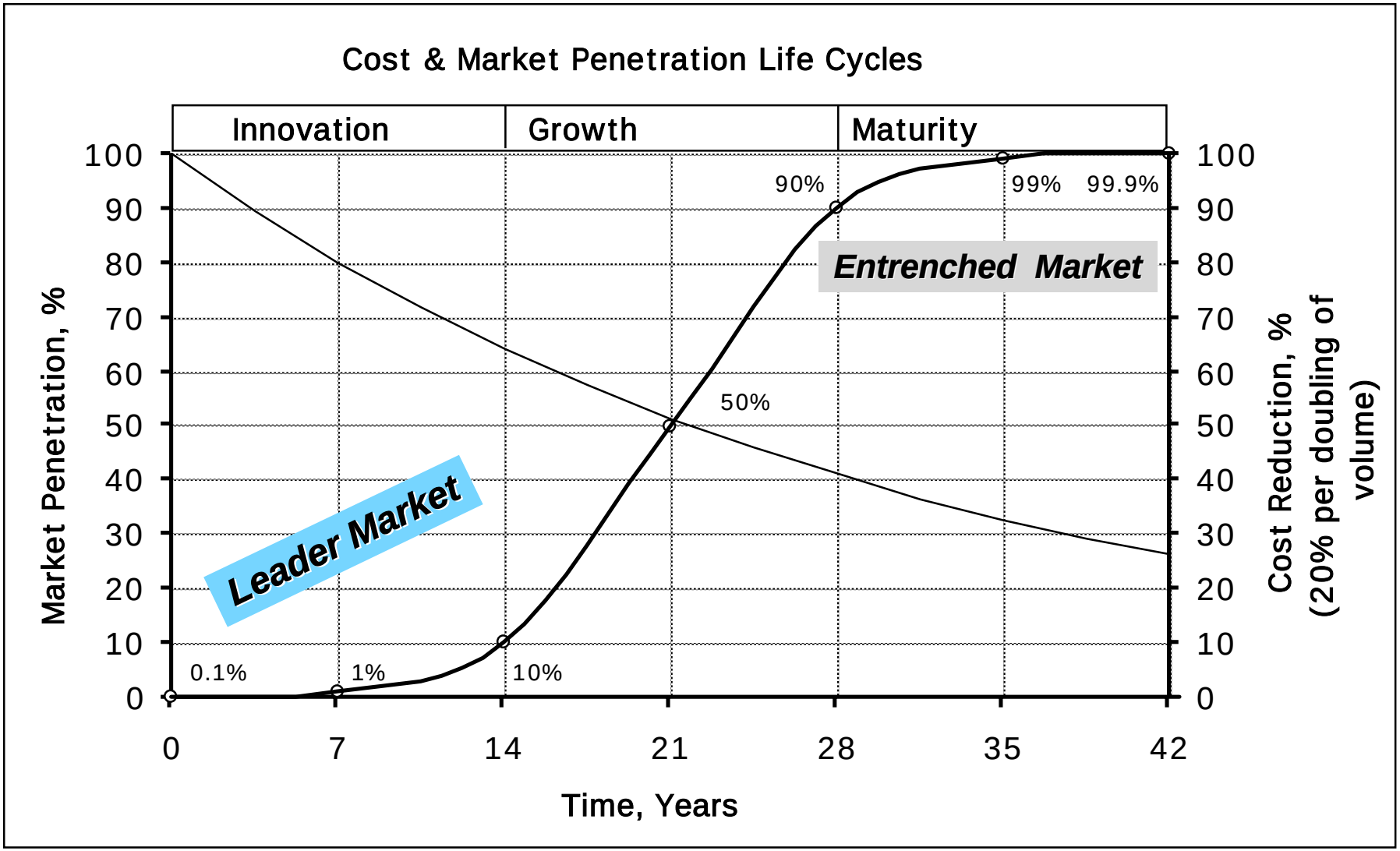

Figure 13

Life Cycle of the Piston Aircraft Market

...or is it really?...

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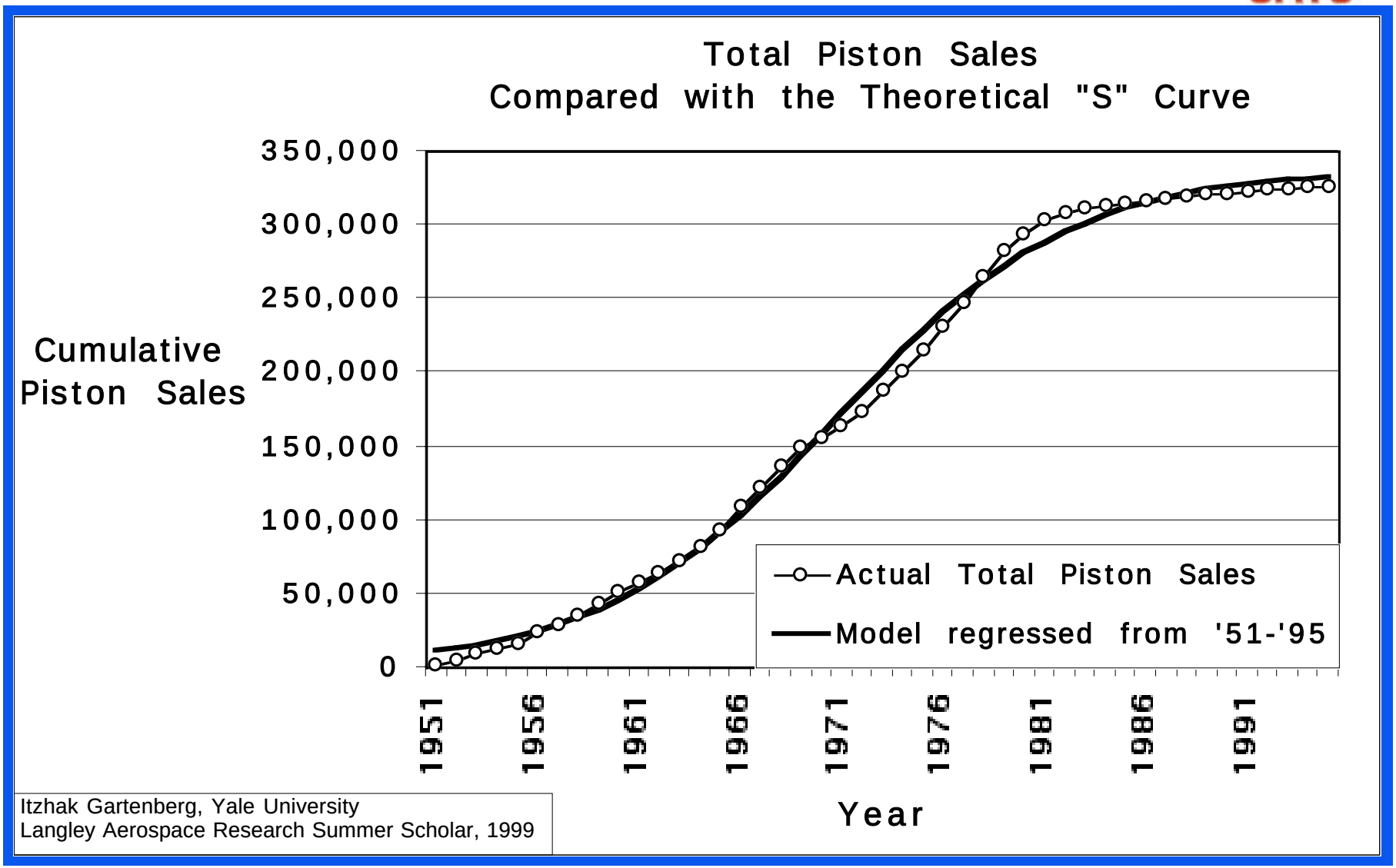

(R)evolutions in Higher Speed Travel

What is Next? More Speed to More Destinations

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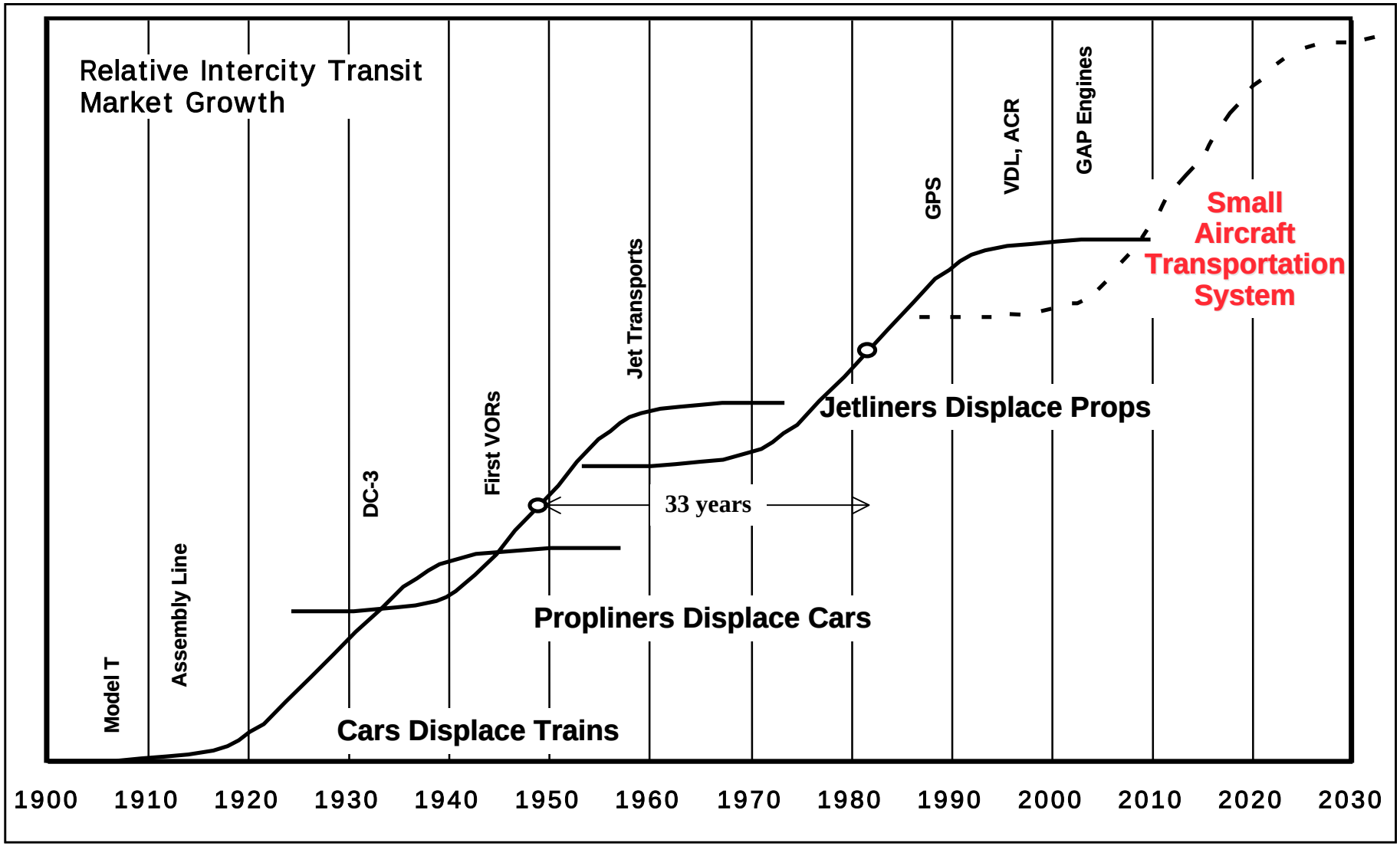
SATS

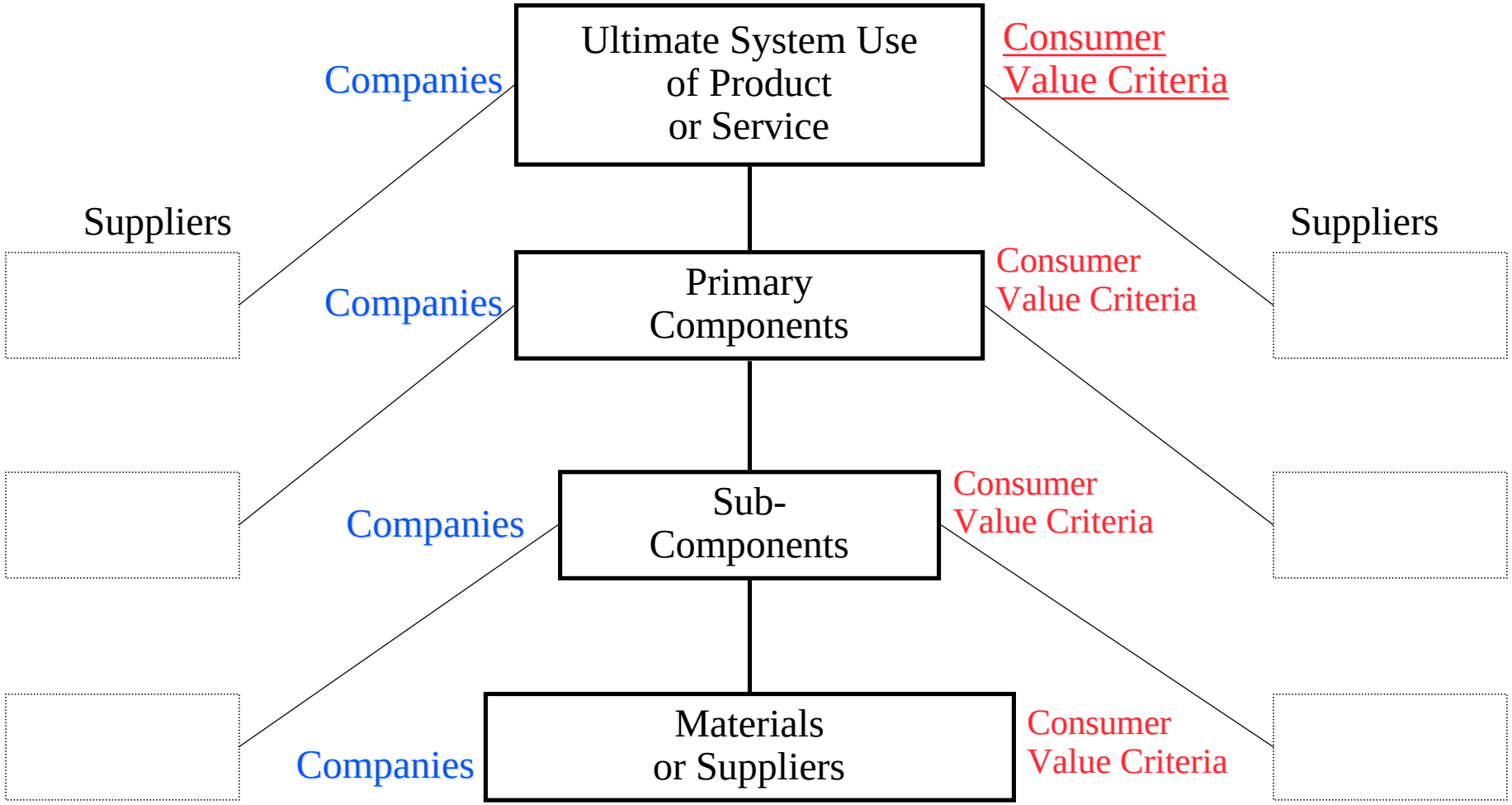
The "Atomic Structure" of Business Innovation Cycles



Value Networks

(Clayton Christensen, The Innovators Dilemma, Harvard Business School Press, 1997)

Value Networks create a nested ecosystem of expected rewards for an incumbent or entrant enterprise serving an existing or latent consumer base



Hub-and-Spoke/Mass Transportation Value Network

Consumer Value Criteria

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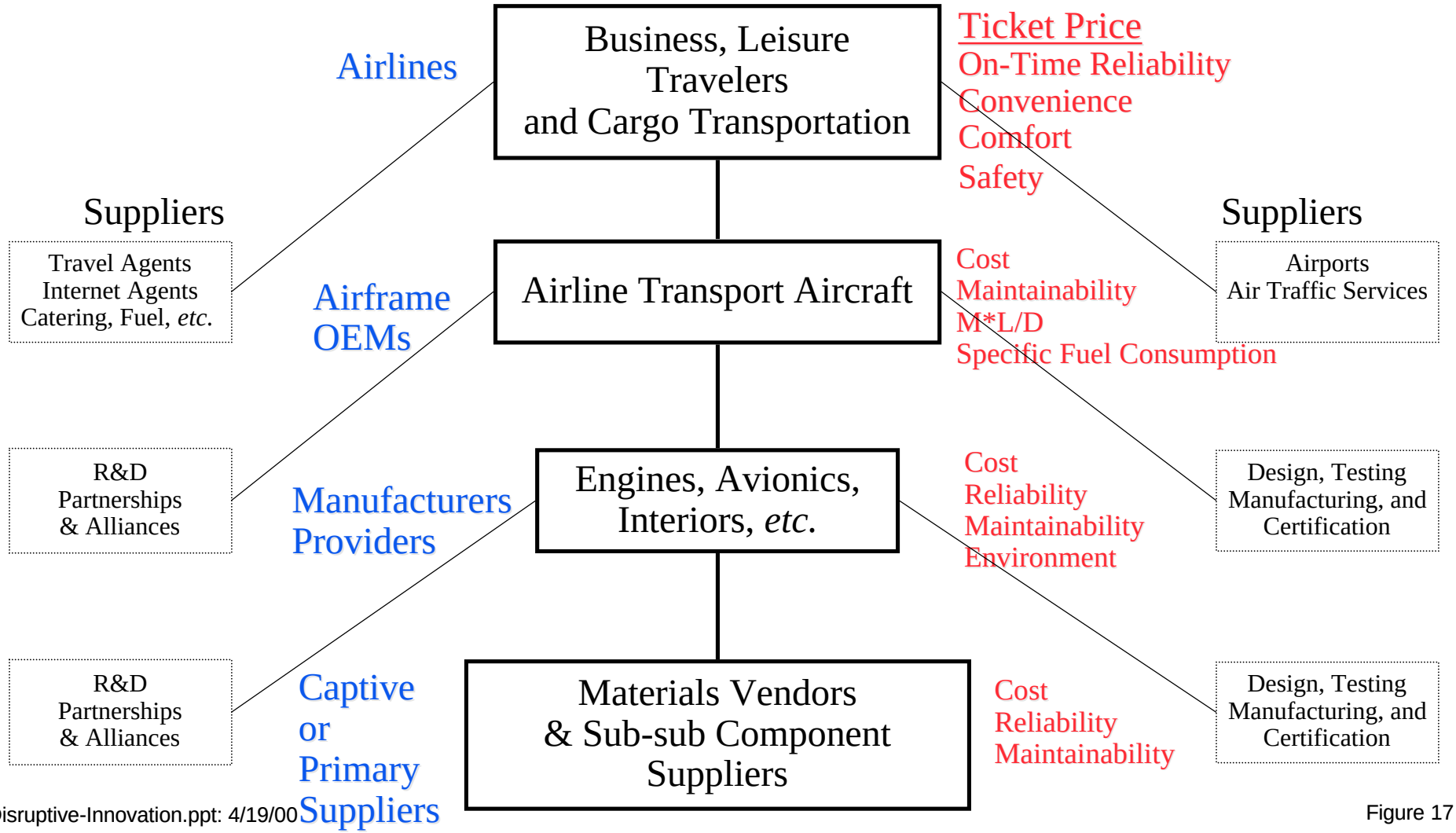
SATS

Expected rewards from existing consumers for an incumbent enterprise (including investors) drive resource allocations toward innovations for growth of the current market.



Solving 21st Century Transportation Challenges

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SATS

The Small Aircraft Transportation System is a safe travel alternative, freeing people and products from transportation delays, by creating access to more communities in less time.

SATS Hypotheses
"Prove SATS Works"

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1. The public can safely operate a SATS vehicle in 4-D, in near all-weather, including abnormal operations
2. The public can afford to travel by SATS
3. SATS infrastructure is an affordable option for national transportation system investments
4. SATS benefits all suburban, rural, and remote communities in terms of accessibility, mobility, economic opportunity, environment and quality of life

Proposed SATS Value Network for Personal Transportation

Consumer Value Criteria

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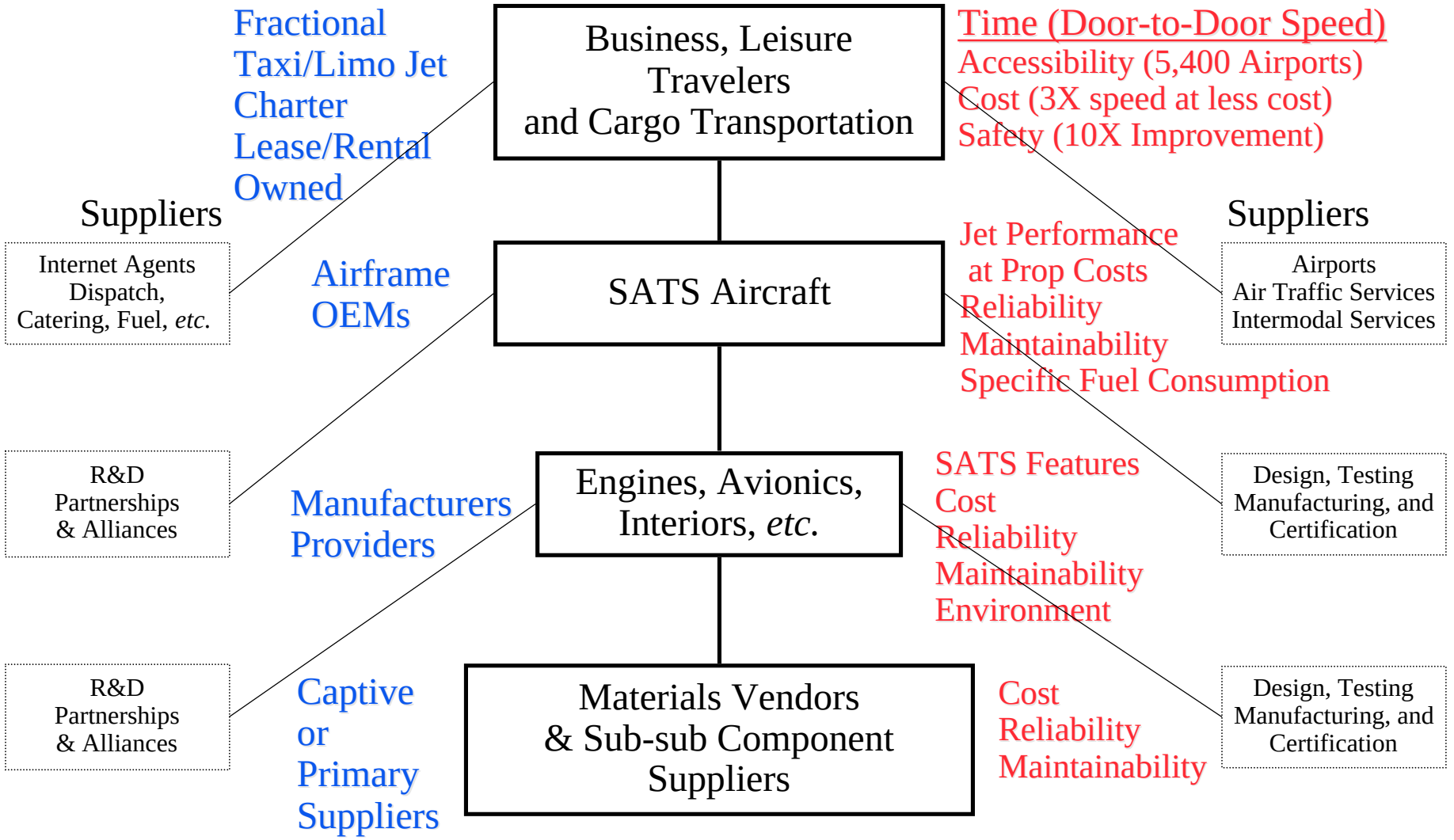
SATS

Expected rewards from latent consumers for entrant enterprises drive resource allocations toward paradigm shifting innovations.



SATS Value Network Metrics
Notional

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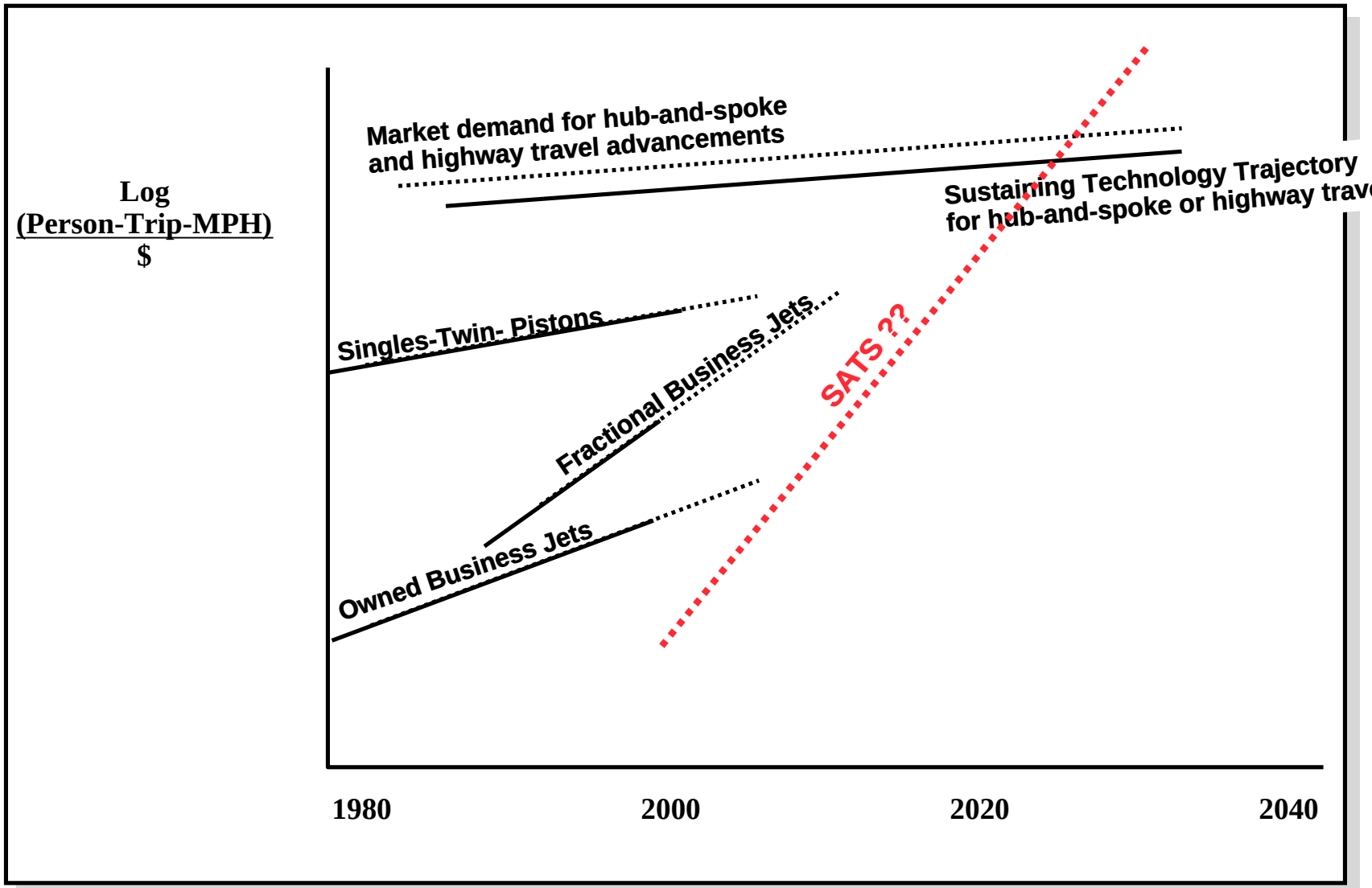
SATS triggers a new disruptive innovation path



SATS Distinctions

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- **The SATS concept establishes a new priority ranking for intercity transportation consumer value-criteria, minimizing door-to-door time.**
- **SATS fills a vacuum not currently populated by transportation services (vacuum left by up-market movements of the rest of the industry).**
- **SATS serves a latent market that cannot be quantified *a priori*; a business case cannot be based on *a priori* known behavior of this latent market.**
- **SATS serves a personalized *versus* a mass/public transportation need.**
- **SATS can become the seed for the future NAS architecture.**

Disruptive Questions

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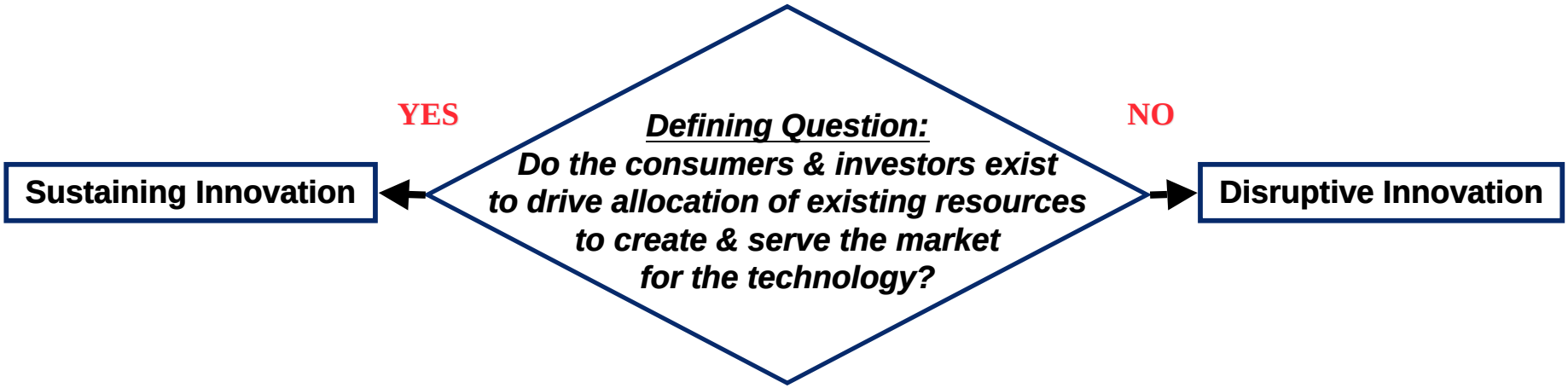
The Defining Question



Implications for SATS

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The NASA motivation for investing in SATS is the creation of the latent transportation market (non-enthusiast, non-hub-spoke, non-highway travel). The new market value proposition for SATS is faster doorstep-to-destination travel to any destination with personal command of time. NASA wishes to partner with industry, government and states partners who can share in these motivations.


The Small Aircraft Transportation System is a safe travel alternative
freeing people and products from transportation delays,
by creating access to more communities in less time.
"Reduce public travel times by half in 10 years and two-thirds in 25 years"
http://sats.nasa.gov